

Coastal Engineering and Geology Group

Office of Resilience and Coastal Protection



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Re: CCCLr Dune Erosion Model – User Guidance
Latest Version Date: May 15, 2020

Introduction

This document is intended to assist in running the CCCLr Dune Erosion Model which is available from the Florida Department of Environment Protection (FDEP); Office of Resilience and Coastal Protection (ORCP); Coastal Engineering and Geology (CEG) Group. For simplicity, CCCLr will be used to reference the model throughout this document.

History

The original CCCLr dune erosion model, also referred to as the Dean Erosion Model, was developed by Dr. Bob Dean at the University of Florida for the purpose of predicting beach dune erosion following a major storm event. The model's results form the basis for Florida's Coastal Construction Control Line (CCCL). Revisions made to the model in 1996 resulted in the version of the model in use today. Application of CCCLr for all monuments in the state of Florida led to the data for the report: *"One-Hundred-Year Storm Elevation Requirements for Habitable Structures Located Seaward of a Coastal Construction Control Line"* in November of 1999.

Vertical Datum

The standard vertical datum in use today is NAVD-1988 and most survey data (both topographic and hydrographic) uses this standard. The other major datum is NGVD-1929 and CCCLr was calibrated using data referenced to this datum. Therefore, it is necessary that all elevation input data to CCCLr must be referenced to the NGVD-1929 datum. All input data to the model must be converted to the NGVD-1929 and afterwards the results can be converted back into the NAVD-1988 datum. A datum conversion utility called CORPSCON is available from the U. S. Army Corps of Engineers and can be obtained here: <https://www.agc.army.mil/What-we-do/Corpscon/>. All data submittals, whether input or output results, should clearly note which datums are used.

Constructing the Input Profile

CCCLr requires the user to create an input profile which will be used as input to the model. The profile is a sequence of (X, Y) data points where X is the distance in feet from a specific point – usually a FDEP Range Monument or the CCCL, which will be referred to as the origin. Y is the elevation at X in feet NGVD-29. This profile should extend landward enough to ensure the erosion limit of the storm can be calculated and far enough offshore as it is practical to obtain. The profile begins at some landward point and proceeds seaward at a transact angle as measured in degrees from the north. This transact angle is typically predefined as the

transact angle utilized for the nearest FDEP monument. In practice for CCCL permit cases the input profile is created in three steps:

1. Upland is created from the current topographical survey for the property which is supplied by the applicant.
2. If the property is located within an active nourishment project area, the nourishment section of the profile shall use a pre-construction survey from a nearby FDEP Monument. The applicant's survey shall be used for non-nourishment areas or where it is deemed that equilibrium of the nourishment project has occurred.
3. The offshore is created from the nearest and most recent FDEP Monument survey and appended at the lowest contour which was created in step 2. This survey data can be found at the Department's Historic Shoreline Data web page at <https://floridadep.gov/rcp/beaches-inlets-ports/content/historic-shoreline-database>.

The input profile must reside in a file in DEP format which is described here:

<ftp://ftp.dep.state.fl.us/pub/water/beaches/HSSD/ProfileData/PFORMAT.txt>

Storm Hydrographs and Surge Levels

CCCLr requires the user to utilize the 100-Year Hydrograph and Surge Level that corresponds to the nearest FDEP Monument to the subject property. This data has been generated for all coastal counties in Florida in which a CCCL was established. It is up to the user to get the necessary data, all of which can be obtained from the FDEP. The hydrograph and surge level reside in the same input file.

For most areas of Florida, the hydrograph is a time series of elevations with a duration of 36 hours and the peak surge occurring at the 18 hour mark. The time step of the hydrograph is 0.5 hours, therefore there are 73 total hydrograph data pairs with the peak occurring at the 37th time step. Charlotte, Franklin, Gulf, Martin, and Nassau Counties have more or less data points and the peaks are not necessarily at the midpoint. CCCLr should be run with all time-steps of the hydrograph utilized in order to generate the predicted 100-year erosion profile. However, for some profiles the hydrograph should be stopped when the maximum storm surge is reached, called the "Half-Hydrograph", and will be discussed next.

When the CCCL and 100-Year Storm Elevation studies were conducted for Lee County, the hydrograph was modified since CCCLr was not calibrated for over wash conditions. The decision was made to end the erosion calculations as the over wash condition was reached. In order to generally match, as closely as possible, the methodology used in previous studies and for the results to be compatible with these previous results, the Half-Hydrograph should be utilized for all of Lee County.

For low-lying profiles that are outside of Lee County, engineering judgment is needed to decide if the Half-Hydrograph should be used. Whether or not the over wash condition has been met should be decided on a case by case basis but in general the Half-Hydrograph should be used if the maximum elevation of the input profile is at least two feet below the 100-year storm tide. This procedure is used to better simulate the physical process of erosion generally ending as the overtopping takes place.

If it is decided the Half-Hydrograph should be used then the full Hydrograph need not be run, otherwise the full Hydrograph is the appropriate Hydrograph to use. The step to accomplish this is explained below.

A-Value Input

CCCLr utilizes an algorithm which depends on an offshore profile which is represented by a scale parameter called the A-Value. This is a floating point number which generally falls within the range of 0.1 through 0.2 and the user can specify the value or have CCCLr calculate it. As nourishments and other processes alter the offshore slope, these A-Values can change over time. The recommended method for which A-Value to enter for any specific shoreline segment of Florida is constantly changing as new survey data is received. The FDEP maintains a list of the current recommendations for the A-Value for all Monuments in Florida. As new offshore surveys are received by FDEP, this list is updated if necessary when analysis of the surveys shows an A-Value change is appropriate. This A-Value recommendation list is available to all who request the data. Please note that the A-Value recommendation list is an ongoing process and the user of CCCLr should ensure the appropriate A-Value is being used. The A-Value guidance document is here:

ftp://ftp.dep.state.fl.us/pub/water/beaches/transfer/CCCLr/CCCLr Model Input Files/AVAL_SS/A-Value-Guidance.pdf .

For any questions or confusion about the A-Value, please contact the person listed in the **Assistance Requests** Section found at the end of this document.

Distribution Files – Executable and Inputs

All files that are needed to run CCCLr are found at

<ftp://ftp.dep.state.fl.us/pub/water/beaches/transfer/CCCLr/> The user should first go to the Executable+Example sub-folder and copy these files to a folder on a local computer:

- **CCCLr.exe** is the executable model,
- **COUNTY.100** is the input file containing the 100-year storm values,
- **COUNTY.IN** is the input survey profile, and
- **Efact5.dat** is the calibration data (the user should not modify this file).

From this folder the user should open a Windows COMMAND PROMPT as the model is a command-line driven executable in which no installation is required. Running the model is simple as the user need only type CCCLr.exe at the command prompt. Please note the ftp sub-folder also includes the output files generated when CCCLr is executed. The user can use these as a test to verify that the model is running correctly on their machine. CCCLr requires the input files to have these file names, the user should overwrite these files with the inputs that match their particular project. When overwriting values, the user **MUST** take great care in ensuring the values are placed in **EXACTLY** the same position as they are in the sample files or else the model will either crash or generate incorrect results.

The COUNTY.100 Input File

The COUNTY.100 file contains many of the variables that the user must supply to CCCLr. This file is a standard text file and can be opened with any text editor such as NOTEPAD. The first two lines are informational only, the model does not use this information, but they can be useful for keeping track of projects.

As described above, the A-Value is an important variable for CCCLr. If the A-Value is to be calculated by the model, then the ICALA parameter (at line 7) should be set to 1. If the A-Value is to be a constant value, ICALA should be set to 0 and the A-Value entered on line 3.

The 100-year surge level is entered on line 14. The appropriate value to use can be found at ftp://ftp.dep.state.fl.us/pub/water/beaches/transfer/CCCLr/CCCLr%20Model%20Input%20Files/AVAL_SS/ and the surge level for all DEP Range Monuments are organized by county.

The remaining section of the file (below the 100-year surge level) is the Hydrograph as described earlier. This data is found at <ftp://ftp.dep.state.fl.us/pub/water/beaches/transfer/CCCLr/CCCLr%20Model%20Input%20Files/HYDRO/> and the user should first look at the A-README.TXT file to determine the appropriate hydrograph to use. Each County's hydrographs are found in the .HYD files and these are also in standard text format. The user should copy and paste the desired hydrograph into COUNTY.100, overwriting the hydrograph that is already there. If the full hydrograph is not going to be utilized, then the user should change the number of data points value that is on line 15.

All other parameters in the input file should not be changed in any way.

The COUNTY.IN Input File

The COUNTY.IN file contains the surveyed profile. Creating this file is definitely the most time consuming step of the CCCLr modeling process. The sample file provided is in the correct FDEP format and this format must be maintained for the model to function correctly. The COUNTY.IN file's format is copied from the Department's format utilized for all survey data collected statewide. The Historic Shoreline Data, including the actual Profile Survey Data, can be found at <https://floridadep.gov/rcp/beaches-inlets-ports/content/historic-shoreline-database>.

Line 1 of the input file is a description of the data and is not used by CCCLr but is very useful for informational purposes.

Line 2 MUST begin with R-1 in the same place as shown in the supplied sample file. The rest of the data on this line is not used but can be helpful information. Usually the rest of the data is the monument date, the origin's northing coordinates, the origin's easting coordinates, and the transact angle of the profile.

The 3rd line has 3 dates followed by the number of data points (N) in the profile. This number MUST reside at columns 25, 26 and 27. N is right justified which means a 2 digit N would be entered on columns 26 and 27. The dates and the data after N are not used by the model.

Line 4 is typically blank and skipped over by CCCLr.

The remainder of the file beginning on the 5th line is the actual survey data. The data is organized in 5 (x, h) pairs per line where x is the distance from the origin and h is the elevation in feet-NGVD29. This data should be formatted with spaces only (no tabs) and the sample file provided is an excellent example of how the data should be formatted. Getting the data into the correct format is the responsibility of the user. The x values increase as the profile extends seaward, negative values are allowed and would represent distances landward of the origin.

Output Files and Errors to Look For

The user MUST remember that all elevations reference the NGVD datum. CCCLr generates several output files:

- AVALUE.OUT holds a single number which is the A-Value used by the model. The user should always check this value to make sure it is the expected value if a constant A-Value was used. For cases where the model calculates the A-Value this value should be a reasonable value.

- SURVEY.DAT is the inputted survey profile down to a depth of 20 feet. This should match the COUNTY.IN data, if not then the COUNTY.IN is not in DEP format. Useful for error checking.
- t.out can be deleted.
- VOLUME.OUT show the calculated area eroded. Most users should disregard this file and delete it.
- INITIAL.DAT is the survey data that has been smoothed. CCCLr requires the input profile have only one value per contour from the top of the dune to the furthest offshore point. This is the actual profile the erosion procedure uses as input.
- ERODED.DAT is the final eroded profile.
- COUNTY.dn1 holds a summary of the final erosion and the erosion extent for all contours. Useful for error checking as well. The WTL = value should be equal to the 100-year surge level found in the COUNTY.100 input file. The DUNE ELEV. is the highest elevation in the input profile. This file also shows the other parameters found in COUNTY.100, the user should ensure they match.

Generally, the user will use the COUNTY.dn1 and AVALUE.OUT files for quick error check to make sure the input files were inputted correctly. COUNTY.IN, INITIAL.DAT, and ERODED.DAT are then converted from NGVD to NAVD if so desired and then an overlay plot of these three profiles can be created and the analysis process can begin.

Assistance Requests

This document, the CCCLr Model, and all associated input files are maintained by the Coastal Engineering and Geology (CEG) Group, Office of Resiliency and Coastal Protection at the Florida Department of Environmental Protection. <https://floridadep.gov/rcp/coastal-engineering-geology>.

For any questions or problems in running the CCCLr model, please contact Mike Manausa by phone at (850) 245-7631 or by email at Michael.Manausa@FloridaDEP.gov.